

CA-IR-27

**Ref: T-9, Pages 10 and 11, HECO 901 Page 12.**

Regarding transmission losses, please respond to the following:

- a. How does HECO anticipate treating the cost of the 46 kV improvements in the instant docket? Will the costs be treated as transmission components or distribution components? Explain why.
- b. HECO-901, page 12 indicates that system losses decrease when selecting 46 kV alternatives. Please explain how losses decrease for the 46 kV options in comparison to the 138 kV options? Provide copies of all documentation and/or analysis conducted to support the response.

**HECO Response:**

- a. The scope of the project includes work on both transmission and distribution equipment. Cost related to transmission work (i.e., the 46kV underground lines and the transformer installations at the Kamoku and Archer Substations) will be classified as transmission and cost related to distribution (i.e., modifications at existing distribution substations) will be classified as distribution.
- b. Transmission losses were calculated for each alternative shown in HECO-901, page 12. Transmission loss calculations include transmission line losses resulting from the generator step-up transformers and losses that occur on the 138kV transmission system. Subtransmission and distribution losses are not included.

Changes to the HECO system alter power flow in the transmission lines and result in either an increase or decrease in losses. The timing of these system modifications is, therefore, an important factor when comparing transmission losses.

As outlined in HECO T-9, a 2010 service date was assumed for both Kamoku-Pukele 138kV Underground Alternatives. A service date of 2006 was assumed for the

Kamoku 46kV Underground Alternative and a service date of 2008 was assumed for the Kamoku 46kV Underground Alternative – Expanded. A service date of 2006 for Phase 1 and 2008 for Phase 2 was assumed for the Kamoku 46kV Underground – Expanded (PROPOSED PROJECT). A service date of 2007 for Phase 1 and 2009 for Phase 2 was assumed for the Kamoku 46kV Underground – Expanded (PROPOSED PROJECT) based on the updated schedule as discussed in HECO ST-6.

The table on page 3 shows the transmission losses for each alternative. These losses were used to derive the incremental revenue requirement impact of transmission losses shown in HECO-901, page 12.

To illustrate the differences in transmission losses, the Kamoku-Pukele 138kV Underground (HPFF) alternative will be compared to the Kamoku 46kV UG - Expanded (PROPOSED PROJECT) alternative. As shown in the table on page 3, the transmission losses for the 46kV alternative decreases in the timeframe from 2006-2009 as compared to the 138kV alternative. With the Kamoku 46kV UG - Expanded (PROPOSED PROJECT) alternative, load is shifted from Pukele Substation to Archer and Kamoku Substations. These shifts move loads currently fed by Pukele Substation closer to the generators at the Waiiau and Kahe Power Plants, resulting in lower transmission losses.

After the 138kV alternative is in-service, the 138kV alternative has lower transmission losses than the 46kV alternative. This is illustrated as lower losses beginning in 2010. As a part of HECO's long-range planning, system improvements which are not a part of the EOTP, alter power flow in the transmission lines and result in either an increase or decrease in transmission losses.

**HECO TRANSMISSION LOSSES (MWH)**

	Kamoku-Pukele 138kV UG (HPFF)	Kamoku-Pukele 138kV UG (XLPE)	Kamoku 46kV UG	Kamoku 46kV UG - Expanded	Kamoku 46 kV UG - Expanded (PROPOSED PROJECT)	Kamoku 46 kV UG - Expanded (PROPOSED PROJECT) Updated Schedule
2003	102,976	102,976	102,976	102,976	102,976	102,976
2004	106,189	106,189	106,189	106,189	106,189	106,189
2005	109,402	109,402	109,402	109,402	109,402	109,402
2006	112,615	112,615	111,844	112,615	111,844	112,615
2007	113,800	113,800	111,508	113,800	111,508	111,508
2008	113,928	113,928	113,620	113,620	113,620	113,620
2009	117,797	117,797	115,227	115,227	115,227	115,227
2010	115,946	116,649	116,834	116,834	116,834	116,834
2011	117,694	118,357	117,914	117,914	117,914	117,914
2012	119,442	120,064	118,993	118,993	118,993	118,993
2013	125,888	126,484	125,565	125,565	125,565	125,565
2014	132,334	132,904	132,137	132,137	132,137	132,137
2015	138,780	139,325	138,710	138,710	138,710	138,710
2016	145,226	145,745	145,282	145,282	145,282	145,282
2017	151,672	152,165	151,854	151,854	151,854	151,854
2018	153,267	153,783	153,493	153,493	153,493	153,493
2019	154,862	155,401	155,132	155,132	155,132	155,132
2020	156,456	157,020	156,772	156,772	156,772	156,772
2021	158,051	158,638	158,411	158,411	158,411	158,411
2022	159,646	160,256	160,050	160,050	160,050	160,050

Notes: Energy losses between test case years are interpolated.

Energy losses are for generator step-up transformers and transmission line losses